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ABSTRACT

A review of the literature regarding computer literacy reveals that schools have much to do to meet their obligation in helping develop a computer literate citizenry. A comprehensive computer literacy instructional program should include the components of awareness, acquisition of skills, and the ability to apply computer knowledge and skill in problem-solving situations. The numerous social issues related to computer technology place a major responsibility on the social studies curriculum of the schools. An examination of elementary, secondary, and college commercial social studies textbooks reveals, with very few exceptions, an absence of discussion of computer technology as a topic to be studied. There is a need to infuse computer technology throughout the social studies curriculum. Social studies programs, to be more relevant, should involve students in using software and in using computers to process data for decision making and problem solving. (RM)

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COMPUTER LITERACY: A RESPONSIBILITY OF THE SOCIAL STUDIES

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COMPUTER LITERACY: A RESPONSIBILITY OF THE SOCIAL STUDIES

From her birth two hundred years ago, America has been a land of technological achievement. The motor car, the airplane, the television, and now the computer have marked this society with their indelible stamp. Education reflects the greater society and shares this fascination with the mechanical and the electronic. It is just as quick to adopt innovative technology; education has matched the nation's technological achievements with its own adoption of radio instruction, educational TV, the video recorder, and now computer assisted instruction (CAI). Advocates of the introduction of computers into the schools have gone so far as to imply that schools without a machine intelligence capability are not offering their students a relevant curriculum which will meet their future needs.

While these fears might to some degree be justified, the hasty and haphazard introduction of computers into the schools might prove a more damaging problem in the long run. Many educational theorists acknowledge that in too many cases local school districts have purchased microcomputers and designated teachers (usually math instructors) to implement CAI programs without any sense of purpose for including this form of communication technology in the school curriculum. An emerging pattern for computer acquisition is for a school district to introduce microcomputers at the secondary level under the direction of mathematics or business education teachers; as funds become available through federal grants, PTA projects, and other sources, the district places additional units at the elementary level. No such pattern has suggested itself for the student audience for these computers; the types of students having hands-on experiences with the microcomputers vary from school district

to school district. In some cases, CAI is limited to particular mathematics classes, data processing classes, and programs for the gifted and/or handicapped. Some schools have placed machines in the library or media center and have assigned the media specialist to instruct all students in the use of the computer. On the basis of these observations on the vagaries of computer implementation, there seems to be a need for school districts to reexamine their goals and philosophies to accomodate the recent and expanding impact of computer technology on instructional practices in particular and the society as a whole.

Computer Literacy

Colleges, universities, consulting firms and other groups are providing teacher pre-service and in-service programs related to computer assisted instruction. Several National Science Foundation projects related to training teachers in the area of computer assisted instruction have been funded. Also, software for use with microcomputers has been developed in the various subject areas. The degree to which these programs contribute to the rate and quality of learning is still being researched by several that are interested in CAI. For given groups of learners, schools have experienced success through computer assisted instruction. However, the writers feel that a more significant issue than the value of computer assisted instruction is the need to help all students acquire computer literacy which will allow them to become contributing citizens of their present and future societies.

It appears that Toffler's "Third Wave," (1980) in some respects is already a reality. Computer technology for example, is a part of our

lives. A high school sophomore named Matt provides a good example of the impact computer technology is having on young citizens of our society. Like a vast majority of youngsters in our society, since he was about eight years old, Matt has been fascinated by electronic games and video games at arcades. As described in Newsweek (1981), the video game pastime is currently a $5 billion obsession of youth and adults in our society. Matt started to develop mastery with the computer while most adults were apprehensive about them. At about age 12, he saved his money and purchased an Atari home video game and gradually collected several of the programs. One of the Atari programs, "Basic Programming," started a desire to have a home microcomputer. Matt's school purchased an Apple II microcomputer during his freshman year of high school. His algebra teacher helped further this interest in computers by allowing him to have periodic hand-on experience with the microcomputer. The number of math students served by a single micro unit limited Matt's opportunity for hands-on experiences. Therefore, he enrolled in a 4-H microcomputer course which met one evening a week. The instructor allowed Matt to bring the microcomputer unit home for a week, and every spare moment during the week was spent at the micro keyboard. As a result of these experiences, Matt convinced his mother and father that his home was incomplete without an Apple II microcomputer. The family acquired an Apple II unit during the summer; Matt sold his Atari, and the money acquired through the sale has been spent on programs for the microcomputer. As a high school sophomore, Matt is a student assistant for the high school data processing teacher. He has developed programs for her and helps other students acquire computer knowledge and skills. Matt's mother and father feel

that a statement in Newsweek (1981) summarizes Matt's initial interest in computer technology:

> Some educators believe that the games help the average youngster develop fundamental academic and practical skills. Most important, is computer literacy, according to Pat Templin, an educational consultant in Woodside, Calif. "We have a whole generation growing up who have no problem at all approaching the computer." Templin says, "They could become the haves." Templin suggests that because game players learn to focus on an entire screen full of blip blapping, flying objects, they will become faster readers and probably safer drivers and baseball sluggers besides. The most enthusiastic video supporters insist that the strategies and geometric patterns of the games give painless instruction in such disciplines as logic, trigonometry and physics.

Matt is not limited to a computer culture for his social interactions. He is a member of his high school football team, a student manager for the basketball team, devotes time to playing with his pets, enjoys listening to music, regularly does homework, develops programs for the microcomputer, and even watches a little commercial television. Matt may appear to be a very talented kid when it comes to computers; however, he has much to learn to become computer-literate. It is hoped that the schools will help him attain this literacy. An increasing number of present and future occupations in our society will be computer related. The need for a computer literate society will be great.

A Definition

Although there is little agreement to be found among current writers professing a universally accepted definition of computer literacy, several aspects of computer literacy consistently appear in the literature suggesting that this term contains elements which can be examined relative to student capabilities necessary to function as citizens in a highly technological society such as ours. These components of computer

literacy are: 1) an awareness of the impact that computers are having upon individuals and society, 2) the acquisition of skills necessary to function with computers, and 3) the knowledge and skill to apply machine intelligence to solve problems and extend one's intellectual ability.

Awareness of the Impact of Computers

The computer is imbedded in the changes that are flowing through our society today. Consequently, it is important that students understand the meaning of these transformations and their relationship to people in order to avoid being intimidated and instead become comfortable with the technology. Such understanding requires an informational base which people can use for making decisions in the course of their daily lives. Bell (1980) and Molnar (1978-79) clearly documented the changes of the past two decades and showed that this trend of rapid change will continue into the next two decades. Since the late 1960's, the labor force in this country has shifted from heavy industry to a focus on information processing and information-related occupations. While jobs in industry and agriculture have been declining in number, a progressive increase is noted in information-related jobs since the 1950's. Advertisements like a series sponsored by the Bell Telephone Co. which appeared in a recent issue of the Wall Street Journal (1982) confirms this shift in our work force. The "ads" attempted to capture the reader's interest by claiming "with more Americans today in information jobs than in manufacturing and agriculture combined, our readers need to learn about our methods for managing information with today's pervasive technological trends."

At the heart of the growth phenomena of information industries

is the computer and its ability to manage large quantities of data with speed and accuracy. Improved computer technology has spurred the production of information and knowledge to the point that 90 percent of all print materials to date have been products of living writers. Such an impact is changing occupations and today's students are faced with 70 percent of the present job market changing during their life time (Molnar 1973). Evans (1979) refers to this change as a revolution which is accelerating with the recent commercialization of the microcomputer. Evans feels that the speed at which changes will occur will be like "magically generated mushrooms bringing a growth period to blossoming in this decade." Toffler (1980) labeling the new order the "Third Wave," believes that we will be faced with changes so great that we are not willing or prepared to examine the implications of these effects. He predicts that the changes have the potential for transforming our homes into centers of work activities as millions of jobs leave the factories and offices and return to our homes! Should this occur, it seems apparent that a series of events will occur that will dramatically change many of our traditional institutions as we know them today, such as education, the family, political structures, and professional occupations. Toffler suggests that a new and better life with expanding opportunities for individuals is possible.

Sources for data storage and computer utilities are growing rapidly and are expected to be of major service to individuals during this decade. Wessels (1974) believes that the presence of such services will give people instant access to large quantities of information through a process as simple as plugging into our present electric utilities for

power. These services will permit individuals the accumulation and instant accessibility of information that reaches into many aspects of our lives. We may be creating a way of life very different from anything man has experienced before. Clearly such trends will leave few individuals untouched. Whether good or bad, the advent of such new social structures must be recognized as a major event to be reckoned with by our educational planners.

If a literate person is one who functions effectively in a rapidly changing computer society, what is the school's role and how should students become prepared to deal with these changes? The National Council of Supervisors of Mathematics (1977) expressed the belief that students in school should be aware of the many uses of the computer in society, such as its use in teaching/learning, financial transactions, and information storage and retrieval. The increased use of computers by government, industry and business raises legal and constitutional issues as individuals seek to protect themselves from invasion upon their private lives. Such conditions demand an awareness of computer uses, limitations, and misuse for students if for no other reason than protection of individual rights.

Seidel (1980) synthesizing the meaning of computer literacy advocated by the Mathematical Sciences Committee in Computer Education, states that one level of computer literacy should provide students with an awareness of what the computer means to society, the impact it can have on education and an understanding of computers in relation to individual privacy, "human obsolescences" and artifical intelligence. Jay (1981) believes that literacy in the new technology must have an

information aspect. Such an information base should include "knowledge about computers in society, in the home for household functions, in recreation and personal record keeping, in business as a marketing agent, and in education as a tool for the mind, and as creative devices for extending the mind's capabilities." Defining computer literacy needs for students in grades K-8, Hunter (1981-82) believes that it is important for students to develop the ability to make informed judgements about social and ethical issues involving computers and communication systems. Hunter also believes that this includes awareness of a variety of computer applications by individuals and society, an awareness of the ways computers affect groups and individuals, and an awareness of computer-related skills and experiences that are important in a variety of careers.

Anderson (1981) feels that for students to be able to function successfully in society they will have to be able to use the computer as a tool in their school work; they will need to know about the limitations, general capabilities and social implications of computers for coping with a computerized society. Watt (1980), writing about the needs for citizenship of individuals in our technological society, also, states that individuals should possess "the ability to understand the growing economic, social, and psychological impact of computers on individuals and groups within our society. This includes the recognition that computer applications embody particular social values and can have different kinds of impacts on individuals and segments of society."

Examing the various psychological affects of the computer technology on individuals, Turkel (1980) believes that computers, by interacting with the user, build a social relationship that displays a range of

"textures, tones and emotional intensities from seeming computer addiction to confessed computerphobia." The relationships Turkel explores become increasingly apparent as news media carry articles about the problems created by children who have become addicted to video games to the apparent chagrin of their parents. Turkel warns that as we think of computer literacy for the masses we will need to consider people who now feel uncomfortable about and sometimes even threatened by the computer. These individuals will need to feel at ease with computers in order to experience relative harmony in their daily lives. Wessels (1974) believes that this large group of "noncomputer individuals are reluctant to disclose their ignorance of the computer's esoteric language and operations." This unfamiliarity prevents discussion about what is happening to individuals relative to this new technology. Wessels believes that it is absolutely necessary for individuals and groups to discuss these critical issues. In this manner, the human being remains in control and the computer will be neither a "menace nor messiah, but simply an extraordinary tool."

Acquisition of Knowledge and Skill to Function with Computers

Speaking of the new social awareness of computers that will occasion a rush to learn about this technology, Evans (1979) predicts that "for those who are informed, employment opportunities will be great; those who remain ignorant, resistant or unwilling to learn about the new technology, will find the world an alarmingly alien place." As educators, we can no longer ignore that many aspects of public and private life that require individuals to possess the skill and knowledge to manipulate the computer for mere socio-economic and political survival. A cashless

society is becoming more of a reality as the business community integrates the computer into normal daily money management between individuals and self-service terminals. Confronted with electronic banking and point of sale merchandising, the average citizen will soon need to understand and master a new technology for protection against abuse or misuse of financial affairs. For the retailer, however, these new methods are essential for improved marketing and inventory control to increase profit. Yet the average citizen should not be left with little understanding and skill to take advantage of the technology to improve their own lives.

Hunter (1980) expects students and teachers will eventually have many electronic information-processing tools available to them as a normal part of their work and study. Information retrieval, data analysis, computation aids, and word processing programs will all become a regular part of a person's repertoire of resources for learning and thinking. These tools will increase student productivity by giving them the ability to deal with more complex problems. Defining computer literacy for children in grades K-8, Hunter further maintains that students should have the skill and knowledge to use suitably pre-programmed computers to assist them in accomplishing tasks and solving problems in their school environments. Computer education in a school environment should integrate the use of programmed materials into the regular curriculum with computers in language arts, math, science, and social studies. Accordingly, such programs should "help the student to develop a sense of control over computers and to learn a variety of tools and techniques for exercising that control." Expanding this thought, Taylor

(1980) suggests that the computer can be used as a tool or tutor to help students increase their productivity in school. As a tool, students can learn to use the computer as "a calculator in math, a map maker in geography, a tireless performer of music, or a text editor in an English class." As a tutor, the student can learn to execute preprogrammed materials designed by "experts" in a particular subject. To execute the programs, the student responds to a computer presentation of subject material, the computer evaluates this response and presents the next lesson. These two modes of computer use are more commonly referred to as computer assisted instruction (CAI). CAI has been used from the earliest applications of computers in education and is an effective method for certain types of learning tasks, particularly drill and practice. Using the computer in this mode will require a certain level of skill and knowledge of computer hardware and software, including various uses of computers for simulation, drill and practice for basic skills, and problem-based dialogue. Given the proper development of this type of knowledge and skill, the student can take greater control of the management of learning utilizing a greater number of resources at his disposal.

Hurschbuhl (1980), Bork (1978-79), and Suppes (1979) predict a major role for the computer in education not only in our schools, but in the home as well. After the first wave of gimmick penetration, Evans (1979) believes that teaching computers will invade the education market on many fronts and will be available to every child. Whether used as a tutor, for word processing, to simulate a decision-making experience, or to provide drill and practice, the microcomputer is rapidly becoming recognized for its effectiveness as a learning tool. We are about to

move on from an era where knowledge has been hidden in the form of games, toys and attractive and friendly machines beckoning the user to become involved to viewing the computer as an essential learning tool. Educators can no longer ignore the fact that the public and private lives of people will be invaded by intelligent machines offered in the most sophisticated and enticing marketing schemes education has ever known.

Application of Computer Technology

The idea that the computer is more than a mere tool has been advanced by several writers. One of the most forceful arguments is presented by Papert (1980) who suggests that if the new technology becomes simply an add-on component to existing school curriculum we will lose the true value of the machine's capacity to facilitate increased mental productivity. To use computers in this manner will create a more expensive educational system which is biased toward its dullest parts, (rote learning). He warns that if computers are used primarily for drill and practice, educators are placing the child in a box from which he cannot intellectually escape. On the other hand, if we open the power of the computer to the child to extend his thinking capabilities, we will give him the power to break out of this box. To Papert, this issue is crucial for educational planners structuring the integration of this technology into the lives of children in school. The computer should become the tool by which the child manipulates ideas and objects thereby gaining a greater image of himself as an intellectual being with a sense of the world around him. The computer helps the child to learn about thinking and the way he himself thinks. Watt (1980) feels that this aspect of computer literacy for students includes, "the ability to write programs

in one or more computer languages, read, understand, and modify more complex computer programs, to use a computer as a problem solving tool, and to analyze information generated by a computer program." In this sense, Taylor (1980) refers to the computer as the "tutee." That is, the student or teacher does the tutoring, talking to the computer in a language it understands. By thus instructing the computer to perform certain functions, the student understands the concepts to be learned, how the computer works, and how the student thinks. Many feel that productive uses of the computer can be found in this mode in which the student waste no time looking for appropriate software pre-designed to tutor him. More specifically, Jay (1981) claims that to be literate in computer technology, "people will need to be able to program computers, write in different languages, solve personal problems with the use of computers, acess mass information sources, develop methods of self education, and have the ability to control the technology in ways that will assist the individual with public decisions about the computer's role in society." The skills and knowledge necessary to function effectively in this manner will require well planned programs with a high level of time commitment by both the user and planner of such programs.

Luehrmann (1980) believes that being a computer literate individual requires an activist role for the user. Doing something with computers rather than merely identifying, recognizing, or becoming aware of computers should be the measure of computer literacy for students in our society. He views the need for computer literacy on par with reading and writing in the school curriculum. This mode of functioning with computers

should teach students the mastery of and intellectual use of the tool to: "1) get information in the social sciences from a large data-base inquiry system, or 2) to simulate an ecological system, or 3) to solve problems by using algorithms, or 4) to acquire laboratory data and analyze it, or 5) represent textual information for editing, and anlysis, or 6) represent musical information for analysis, or 7) create and process graphical information." These uses in education allow students to become the masters of computers and computing and not its subjects. For Luehrmann (1980) computing "belongs as a regular school subject for the same reason that reading, writing and mathematics are there. Each one gives the student a basic intellectual tool with wide areas of application to the real world."

The preceeding review of literature regarding computer literacy seems to reveal that the schools have much to do in meeting their obligation in helping develop a computer literate citizenry. A comprehensive computer literacy instructional program should include the components of awareness, acquisition of skills, and the ability to apply computer knowledge and skill in problem solving situations. The numerous social issues related to computer technology places a major responsibility upon the social studies curriculum of the schools.

The Responsibility of Social Studies

Current professional writing in social studies appears to ignore the impact of computer technology upon society and the responsibility of social studies for helping elementary and secondary school students adquire computer literacy. Diem (1981) is to be complemented for his contribution; however, as he points out, his work should be viewed as a

starting point for social studies teachers and not the final word on computers in education. An examination of elementary, secondary, and college commercial social studies textbooks reveals, with very few exceptions, an absence of discussion of computer technology as a topic to be studied. National Science Foundation-funded studies (1979), as well as others, suggest that the textbook is the dominant source of content for social studies in elementary and secondary schools. Therefore, it may be concluded that social studies has not accepted its responsibility for helping students become aware of the impact computer technology is having upon their society.

If the primary goal of social studies is citizenship education, the responsibility of social studies for computer literacy is obvious. The social studies programs of elementary and secondary schools should provide numerous experiences to help learners develop an awareness of the impact computer technology has upon society and provide a base for these learners to utilize this technology in their lives. Social studies has a responsibility to help students understand their contemporary culture and project the future of the culture. Computer technology is a reality of contemporary society and it is certain the elementary and secondary school students of today will be employed in careers that make extensive use of computer technology.

As with career education, minority studies, global studies, and other major societal concerns, there is a need to infuse computer technology throughout the elementary and secondary social studies curriculum. Some students are acquiring skill in computer usage outside the school environment. Many are also using computer technology for leisure

activity as evidenced by the video game industry. With little attention given to computer technology in social studies programs, students have a difficult time relating school experiences to the real world outside the school environment.

Social studies programs of elementary and secondary schools should provide many opportunities for students to increase their literacy in the areas of acquisition of computer skill and application of these skills. The social studies programs as well as programs of other subject areas must provide many opportunities for all students to acquire skill in use of computers by using software currently available as well as software that will be developed in the future. Also, if the social studies is serious about the need to relate the curriculum to the real issues of the community, nation and world, there should be many opportunities to use computers to process data for decision making and problem solving. Perhaps if these practices are carried out in social studies programs, social studies will no longer be rated as the least liked subject among elementary and secondary school students as reported in NSF studies (1979). These same students may feel that the social studies is relevant because the experiences provided will be assisting them in acquiring computer literacy.

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